PHYS 102 The Physics of Sound and Music

The Combination *PHYS 102/122* has no prerequisites.
You can use this combination either as a lab science or science perspective. Pick One.

Instructor: Michael Ruiz, Ph.D.; Text: Online. **You need Internet access with Google Chrome.**
The textbook is free and at our website (a $200+ Savings). ruiz@unca.edu

August 2020

Lab Week	Monday	Tuesday	Wednesday	Thursday	Friday
2 	3	4 Attendance	5 Quizzes due	6 the day of	7 the class.
9 L1. Measure-ment	10	11 A. What Is Sound?	12 Last Day to Drop/Add is 08/14/2020	13 B. Vibrations	14 Lab L1 Due by 11:59 pm
16 L2. Waves	17	18 C. Waves	19	20 D. Wave Applications	21 HW A, B Lab L2 Due by 11:59 pm
23 L3. The Oscilloscope Start P1	24	25 E. Modulation	26	27 F1. Lissajous Figures	28 HW C, D Lab L3 Due
30 L4. Modulation	31				

Website: https://www.opus.unca.edu/sound_2020/

Our online course website was a top science and Technology news story on *CNN* in 2002.

First Things to Do

1. Syllabus: Read this Syllabus and Quick Info at our Website.

2. Online E-Book: Go to above Website > Login > First Log-In

3. Class: Attend the 1st Class: Login > Left Menu > Lectures > A

4. Honor Code: Watch the entire 75 minutes for Class A on your honor 8/11/2020 or before.

5. Attendance Quiz: Left Menu > AT > Submit Quiz Answer A some time 8/11/2020 or before.

6. Late Attendance: Do the above plus 4 Extra Credits (EC) in Chapter A of our E-Book.

September 2020

Lab Week	Monday	Tuesday	Wednesday	Thursday	Friday
L4. Modulation		1 F2. Just Diatonic Scale	2	3 G. Strings	4 HW E Lab L4 Due
6 L5. The Diatonic Scale	7	8 H. Pipes	9	10 I. Fourier Analysis	11 HW F, G Lab L5 Due
13 Exam E1 and start Project P1	14 E1 on Classes A-G 6-8pm*	15 J. The Moogerfooger	16	17 K. The Laws of E&M	18 HW H, I Due
20 Lab Exam LE1 & finish Project P1	21 LE1 on Labs 1-5 6-8pm*	22 L. Sound Systems	23 	24 M. Analog Electronics	25 HW J, K Project P1 Due
27 L6. Harmonics	28	29 N1. Tuners	30 Break 	*If you can't make this time, email me.	

Class Responsibilities and Resources (ruiz@unca.edu)

1. Online Text: You have a pdf text and an interactive e-text with multimedia.

2. Power Notes: Guided sheets you can fill out in class. Go to the Downloads Section.

3. Homework: Due 11:59 pm Friday night. You are on your own if you do it after office hours.

4. Labs: Due 11:59 pm Friday night. You are on your own if you do them after office hours.

5. Projects: There are two projects you work on over a period of weeks. Know these due dates.

6. Office: T 10-11:30, W 10-11:30, 1:30-3:00, R 10-11:30. See Zoom Office after signing in.

7. Peers: We encourage you to get to know classmates and work/study together if possible.

8. Attendance (50): You can miss 2 classes, but there is a bonus (10) for attending all classes.

9. Tutorials: There are short tutorial videos for you. Also, you can go to the Zoom Math Lab.

10. Exam Reviews. There are old exams with solutions, reviews, and actual exam questions.

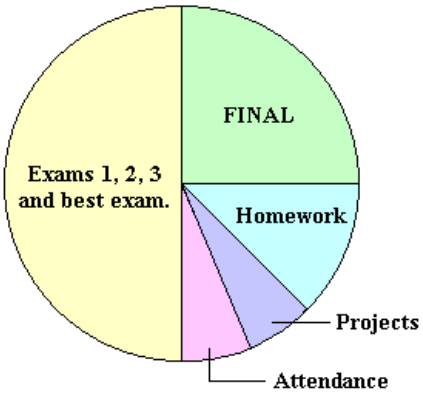
11. Extra Credit: Do questions in the "Chapters" up until the last lecture day of classes.

12. Sound Apps: Explore physics with our sound apps to help you master the material.

October 2020

Lab Week	Monday	Tuesday	Wednesday	Thursday	Friday
L6. Harmonics				1 N2. Digital Electronics	2 HW L, M Lab 6 Due
4 L7. Fourier Synthesis	5	6 O. Signal Processing	7 Last Day to Withdraw is 10/09/2020	8 P. Moog Synthesizer I	9 HW N Lab 7 Due
11 Exam E2 and start Project P2	12 E2 on Classes H-N 6-8pm	13 Q. Moog Synthesizer II	14	15 R. The Ear	16 HW O, P Due
18 L8. Digital Electronics	19	20 S. Perception	21	22 T. Audiology	23 HW Q, R Lab 8 Due
25 L9. Spectro-grams	26	27 U. Spectro-grams	28 	29 V. Musical Tempera-ment	30 HW S, T Lab 9 Due

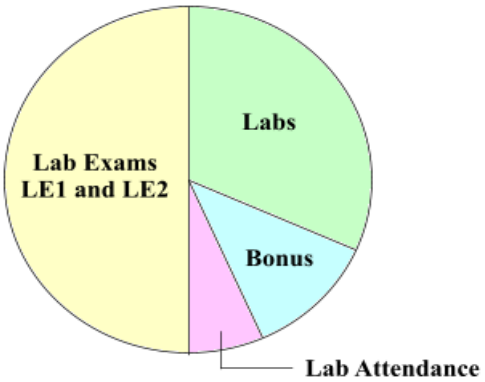
PHYS 102 Lecture (3 credits hours)



100	Exam 1 aka E1
100	Exam 2 aka E2
100	Exam 3 aka E3
200	Final aka FN
100	Best Exam Percentage
100	Web Homework (Due Weekly)
50	Two Web Projects (25 points each)
50	Minus 5 per miss after 2 free misses
800	**Total** (No + or - Grades, See Below)

PHYS 102 Bonus and Borderline: If you attend all classes you get a 10-point bonus. If your grade is borderline, I will consider helping you if you come to class, put in effort with homework (HW), P1, P2, and extra credit. For very close cases I will also look for a strong Final. You may also retake E1, E2, and/or E3.

PHYS 122 Lab (1 credit hour)



200	Lab Exam 1 aka LE1
200	Lab Exam 2 aka LE2
250	Labs (for getting all 25 “happies” per lab) DO ALL 25
100	Effort (+10 for getting at least 18 per lab but do all 25)
50	Attendance (+5 for at least 13 per lab, but do all 25)
800	**Total** (No + or - Grades, See Below)

PHYS 122 Borderline: If your grade is borderline, I will consider helping you if you have a near perfect lab, which means you received over 23 “happies” out of the max of 25 possible for each lab. I can help you out the most if you have all 25 “happies” out of the max of 25 possible for each lab. You can retake LE1.

November 2020

Lab Week	Monday	Tuesday	Wednesday	Thursday	Friday
1 L10. Living Creature Sounds	2	3 W. Wood-wind Instruments	4	5 X. Brass Instruments	6 HW U, V Lab 10 Due
8 Exam E3 and finish Project P2	9 E3 on Classes O-U Any Time	10 Y. String Instruments	11 	12 Z. Circle Of Fifths	13 HW W, X HW Y, Z P2 Due
15 Lab Exam LE2 & Final Exam FN	16	17 LE2 L1 8 am LE2 L3 2 pm LE 2 L4 8 am	18 LE2 L2 8 am LE 2 covers Labs 6-10	19 FN on Classes A-Z 3:00 pm	20 FINALS WEEK ENDS
22	23	24	25 *Thanksgiving Begins*	26 	27 
29	30				

How to Succeed in Sound

1. Time. Reserve each week 3 hours for attending lectures and 3 hours for the lab. Then reserve at least 2 hours (reading, study, web apps, multimedia, assignments, etc.) for every hour of lecture class, which leads to a total of 12 hours per week. If you are a full-time student and have a job, you should NOT work more than 15-20 hours per week.

2. Instructor. Drop by office hours. If you have any problems, come talk to me or email me.

3. Peers. Do assignments and study with your classmates if possible. You master the material when you are challenged to explain it to someone else.

Come to every class and take notes. Do not fall behind! Science classes build on previous classes. Use our “Exam Practice”, where you see actual exam questions. If you spend lots of time with “Exam Practice” you will virtually see all the possible questions that can be on your exams. But the best advice is to first carefully study the solutions to old exams.

UNCA is committed to making courses accessible to persons with documented special learning needs. To apply, register with the Office of Academic Accessibility and then contact me ASAP.

The Friday Rule: If you wait until the due date (Friday), you are completely on your own, no matter what problems arise, including computer difficulties. However, there will be at least one Grace Period near the end of the semester in order to make up some missed assignments.

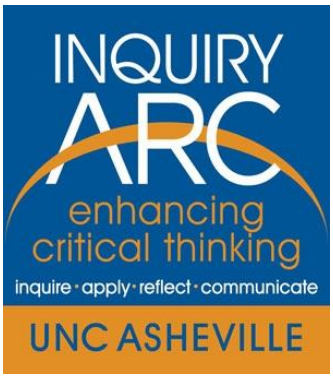
December 2020

Monday	Tuesday	Wednesday	Thursday	Friday
	1	2	3	4
7	8	9	10 	11
14	15	16	17	18
21 	22	23	24	25 
28	29	30	31 	

Lecture/Lab (Online): Asynchronous with attendance quizzes due or before the lecture day.
Academic Integrity: HONOR CODE for attending class and taking exams without notes/help.

Music in PHYS 102, I-ARC, and *CNN*

Goals/Outcomes. *The Physics of Sound and Music* incorporates classical music, jazz, and popular music. Our course also includes the Moog synthesizer, some electronics, sound reproduction, the study of hearing loss, the psychology of perception, and some music theory. At times, your instructor, a musician, will demonstrate musical concepts by performance, illustrating a diversity of musical styles. You will learn to appreciate sound and its many applications and expressions in the world.



We follow the *UNCA* I-ARC model: Inquiry (understanding the question or problem at hand), Apply (using the appropriate principle, law, or formula), Reflect (reflecting on the answer to verify its validity), and Communicate (finally giving the answer with confidence with proper units and significant figures).

Our course was a top science/technology news story on *CNN: E-Book Learning*, which aired on *NEXT@CNN*, August 31, 2002. You can bookmark http://www.opus.unca.edu/sound_2020/